



Insect Control of the Invasive Toadflax

The Question: Will the introduction of biological control insects for the control of invasive toadflaxes threaten native plants?

Yellow (*Linaria vulgaris*) and Dalmatian (*Linaria dalmatica*) toadflax are two invasive plants of concern to managers at the park. Both species were introduced to North America from Eurasia as ornamental garden plants, but have since escaped cultivation and today infest many relatively undisturbed natural areas such as wet meadows, upland, arid areas, and even alpine tundra such as that along Trail Ridge Road. Due to its opportunistic persistence, yellow toadflax is considered by some land managers to be one of the top species of concern in Colorado and the West.

Control of invasive plants with chemical herbicides is an undesirable management technique in some sensitive ecosystems. An alternative strategy currently employed for managing undesirable, exotic vegetation is the use of natural enemies, or biological control insects, which are collected from the same home range as an invasive plant and are specialist herbivores that weaken the competitive ability of invasive plants. The most promising biological control insect currently available for control of the toadflaxes is *Mecinus janthinus*, a small, black, stem-boring weevil from Eurasia. Before introducing a non-native biological control insect to the park, however, resource managers desired a greater level of confidence that the weevil would not also eat and reproduce on native plants closely related to the toadflaxes such as beardtongue (*Penstemon spp.*), monkey flower (*Mimulus spp.*) and others in the Scrophulariaceae family.



The non-native, Dalmatian toadflax.

The Project: Observe the effects of the biological control weevil in greenhouse and field experiments with the non-native toadflax and other closely related native plants.

In order to address whether *Mecinus janthinus*, the biological control weevil, might threaten native plants, investigators Nehalem Breiter and Timothy Seastedt (Colorado State University) conducted caged force-feeding experiments in the greenhouse and the field using a variety of native plants thought to be the most likely alternative host plants. In the caged experiments, they monitored weevils for eight weeks and collected data on the amount of feeding, number of oviposition (i.e., where insect eggs were deposited) scars, and number of insect larvae found in plant stems. To determine whether the weevil is using native plants in a field situation, they visited sites in Colorado and in the Pacific Northwest where the weevil is currently used to control toadflax. They inspected the leaves and stems of closely-related native plants growing at these field sites for evidence of feeding and reproduction by the weevil.



Greenhouse and field experiments indicate that the weevil impacts the toadflax but no other closely-related plants.

The Results: *Mecinus janthinus* affects only the toadflax.

Results of the greenhouse and field caged experiments demonstrated that native plants were not preferred host plants for the weevil, as compared to the invasive yellow and Dalmatian toadflaxes. In fact the native plants presented to the weevil in the force-feeding experiments were rarely nibbled or oviposited on by the weevil. Assessments of native plants at field sites where the weevil has been released to control toadflax presented a similar outcome. No evidence of weevil use was found on the native plants examined at the weevil release sites.

Overall results of this study provide good evidence to negate the concern that *Mecinus janthinus* will have negative impacts on native plants in the Scrophulariaceae family. This is good news considering that the weevil is currently used throughout the Western United States to manage toadflax and may find its way into the park on its own. If the stem-boring weevil has not already arrived, the park is open to introducing it but also takes into account that biocontrol programs are more successful when several insects can be used, each attacking another part of the plant beyond the stem.

This summary is based on published, peer-reviewed and/or unpublished reports available at the time of writing. It is not intended as a statement of park policy or as a definitive account of research results.

For more information on the park's research program, see www.nps.gov/romo

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